ON THE RADULA OF THE GENUS *ACANTHINA*, G. FISCHER.[1]

By the Rev. A. H. Cooke, Sc.D., F.Z.S.

Read 9th November, 1917.

The genus *Acanthina* is peculiar to the west coast of America, ranging from Bolinas Bay in the north to Cape Horn and round to the Falklands in the south. The species hitherto known under the name fall into three geographical groups.

1. The northern, comprising *paucilirata*, Stearns, *punctulata*, Sowb., and *unicarinata*, Sowb., and extending from Bolinas Bay to San Diego.

2. The central, with *brevidentata*, Wood, *grandis*, Gray, and *muricata*, Brod., ranging from Lower California (point unknown) to Paita, including the Galapagos.

3. The southern, with *calcar*, Martyn, and *crassilabrum*, Lam. (many unite the two as one species), ranging from Peru southward, round to the Falklands. *A. lugubris*, Sowb., whose northern limit is Todas Santos Bay, San Diego, but whose southern range is not precisely known, though it reaches the Galapagos, forms a connecting link between the northern and southern groups.[2]

P. Fischer (Manuel de Conchyliologie, p. 646) remarks: "Les *Acanthina* ne sont en réalité que des *Purpura* et peuvent être divisés en sections correspondant à celles de ce genre par leurs principaux caractères. L'*A. lugubris*, Sowb., est un *Thalessa*, l'*A. crassilabrum*, Lam., un *Polytropa*, l'*A. muricata*, Brod., un *Planithais*, etc., les exemples montrent que le caractère tiré de la présence d'une dent au labre est tout à fait artificiel et sans valeur."

There is much to be said in favour of the view contained in the last sentence quoted. But the additional evidence drawn from an examination of the radula tends to show that the different geographical groups of *Acanthina*, as laid down above, exhibit well-marked differences in the structure of this organ, that accentuate the obvious dissimilarity of the shells. Viewed in this light the northern and southern groups stand apart from one another, while the central group, or what remains of it, differs strongly from both, if it does not disappear altogether. The affinities of *A. lugubris*, Sowb., lie with the southern group. From a conchological point of view one would have expected this to be so. The more globular form and wide mouth, and also the very prominent tooth of *lugubris*, bear more resemblance to the forms of *calcar* and *crassilabrum* than to the narrow long-drawn shape of the Upper Californian *Acanthinæ* with their extremely tiny hook.

---

[1] All the radulæ employed in the preparation of this paper belong to the collection of the late Professor H. M. Gwatkin, now in the Natural History Museum, South Kensington.

[2] Compare R. E. C. Stearns, Amer. Journ. Conchology, vii, 1872, pp. 167–71; W. H. Dall, Proc. U.S. Mus., xxxvii, 1909, pp. 147–294; Melvill & Standen, Ann. Mag. Nat. Hist., ser. viii, vol. xiii, 1914, p. 123.

It will be convenient to take first the representatives of—

I. The Central Group.

1. *A. brevidentata*, Wood. The rhachidian has a strong, pointed central cusp, the two side cusps are strongly singly denticled on the inside, three or four small denticles, scarcely climbing,[1] intervene between the side cusps and the external projection (the "knob"); the base is simply curved below. In other words, the radula is of the normal *Thais* type, hardly to be distinguished from that of many species of that genus.

The spine or spines, for there are sometimes traces of more than one, seem scarcely analogous with the corresponding formation in other Acanthinæ. In *brevidentata* the spine is a continuation of the external layer of the shell surface, and projects from it, while in certain of the other species its shape and position suggest an origin from one of the internal denticulations within the mouth. In *brevidentata*, as well as in the other species, the characteristic groove is present, marking the line of growth of the spine.

I propose to relegate *brevidentata* to the genus *Thais*. Both the shell and the radula are in close agreement with that group, and the presence of the spine on the outer lip is too common a feature in other genera to warrant a separation.

2. *A. muricata*, Brod. This species shows a different and very striking type of radula. The rhachidian tooth is very thick, tricuspid on a broad base; the central cusp is long, sharp, and flanked by two small similarly shaped side cusps, which are only one-fourth the length of the central cusp, and are closely adjacent to it. There are no denticles, either on the side cusps or beyond them, while the knob does not exist. The base is simple, slightly arched below. The laterals are broad-bladed, widening rapidly from a sharply curved apex, with a greatly produced base.

In general facies this radula (see Fig. 1) bears not the remotest resemblance to that of any other form of *Acanthina*. The type to which it is most closely allied appears to be that of *Rapana*, and I am inclined to think that, both conchologically, and from the point of view of the radula, *A. muricata*, whose position among the other west coast Acanthinæ must surely have puzzled many conchologists, must be separated from them and placed, with *grandis*, Gray (whose radula is not yet known), in a new subgenus of its own, close to *Rapana* of the Old World. Neither from the point of view of the shell nor from that of the radula (so far as it is known) can these two species any longer be associated with the west coast Acanthinæ, in spite of R. E. C. Stearns' remark that "the projecting wave is, in his specimens, developed into a horn of sufficient prominence to enable the shell to enter the genus on its own hook". It has been abundantly shown that the possession of a "horn" is often an accident of development, especially in west coast genera.

Neorapana, n.subgen., is therefore here proposed by me, having

[1] By a denticle "climbing" I mean ascending the external edge of the side cusps.

Acanthina muricata, Brod., for its type, *A. grandis*, Gray, being associated with it.

II. The Northern Group.

Paucilirata, Stearns
Punctulata, Sowb.
Unicarinata, Sowb.

All three species exhibit the same type of radula, with but little modification (Figs. 3, 4). The central cusp of the rhachidian is long, sharp, and thick, and is sunk in a sort of shallow pit between the two side cusps; it is mounted on a thick and rounded pillar, which runs right through to the lower base of the tooth, in which its end forms a rounded projection. Thus the base is doubly curved, with this projection between the curves. The side cusps are broad, sharply pointed, denticled strongly on the inside and less strongly on the outside; they are mounted on a sort of thickened and rounded buttress, not so thick as the pillar of the central cusp, and not running through to the base. The knob is prominent and elevated, and sometimes there are signs of an additional small denticle between it and the external denticle of the side cusp.

These features constitute a very wide distinction between this type of radula and that of *Thais* proper (Fig. 2), in which the three cusps, whether denticled or not, form simple knife edges on the upper margin of the tooth, and have no deep-set pillar or buttress on which they are mounted.

On the other hand, the type of radula now described as present in these northern Acanthinæ is precisely that of the genus *Nucella*. All the West American "purpuroid" forms known to me, *lima*, Mart., *plicata*, Mart., *emarginata*, Desh., and their varieties, with our own *lapillus*, L. (Fig. 5), exhibit a radula of this type, the different species differing only in minor details. Thus the northern group of *Acanthina*, from the point of view of the radula, stands in very close relation to *Nucella*, from which it is a probable derivative. *Acanthinucella*, n.subgen., is now proposed by me for the reception of these northern *Acanthina*, having *A. punctulata*, Sowb., as the type.

III. The Southern Group.

A. calcar, Martyn, with its closely related species, or variety, *unicornis*, Brug. (= *crassilabrum*, Lam.).

In each of these forms the rhachidian tooth differs from that of the northern group in the following points.

1. The central cusp, which is much broader, and not so thick, is not sunk in a shallow pit between the side cusps.

2. It is not mounted on a strong pillar carried through to the lower side of the base, but its roots are just sufficiently carried through to cause a slight projection in the base-line.

3. The side cusps are not buttressed.

4. The knob appears to be doubled, because the plate which carries both the cusps and the usual knob is superposed on a support or framework which is also sharply knobbed at the two upper angles.

Troschel (Das Gebiss, ii, pl. xiii, figs. 7, 8) gives what are in some

respects good figures of the two forms. In fig. 8 (*crassilabrum*) the roots of the central cusps are not carried through to the base, as they should be, while in fig. 7 (*calcar*) I am not able to recognize the two prominent denticles which he figures between the side cusps and the knob. Again, the central cusp of *calcar* should not be so bluntly bullet-shaped, but should approximate closely in form to that of *crassilabrum*.

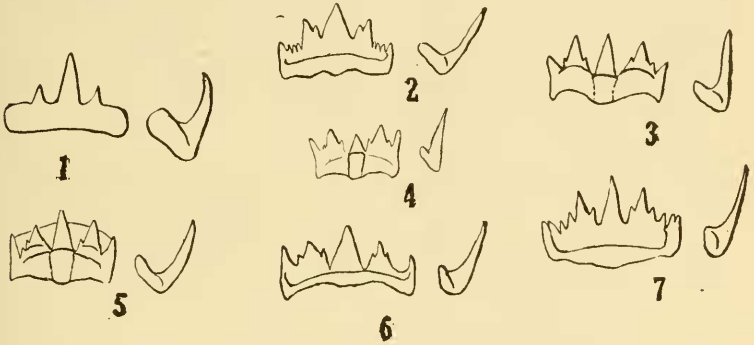

FIG. 1. *Neorapana muricata*, Brod. Panama.
,, 2. *Thais brevidentata*, Wood. Panama.
,, 3. *Acanthinucella punctulata*, Sowb. California.
,, 4. *A. unicarinata*, Sowb. California.
,, 5. *Nucella lapillus*, L. Torquay.
,, 6. *Acanthina calcar*, Mart. Chili.
,, 7. *A. lugubris*, Sowb. Lower California.

In *crassilabrum* the central cusp is somewhat more broadly triangular than in *calcar*; the denticle on the inside of the side cusps is strong, and points slightly towards the central cusp; that on the outside is weak. In *calcar* (Fig. 6) the outside denticle is somewhat more prominent, while what may be called the false (or underneath) knob is sharp and very long. In both forms the central cusp is not greatly longer than the side cusps.

These differences in structure on the whole are small, and offer no obstacle to the view that the two forms are conspecific; one would expect the causes which have made the shell to vary to produce some variation in the radula.

IV.

Finally, the radula of *A. lugubris*, Sowb. (Fig. 7), appears to be of a form intermediate between that of the northern and the southern groups, but more akin to the latter.

The central cusp is long and narrow, set on a pillar which is faintly carried through to the base, and forms a slight projection on the under-side. The side cusps, which are sharp, are not set on a buttress, they carry a strong sharp denticle both on the inside and outside, then comes a single toothlet, sharp, prominent, quite detached; at the base of the knob is another smaller toothlet or denticle; knob strong, prominent.

The rhachidian, as a whole, conveys an impression of extreme sharpness in all its cusps and denticles. The absence of the buttress in the two side cusps, and the less powerful pillar on which the central cusp rests, appear decisively to range the species with the southern and not with the northern group.

In all the species under consideration, except *muricata*, the laterals afford little assistance in grouping, for (*a*) their shape is, in essentials, similar throughout, (*b*) experience shows that a very slight change in the position of a lateral on the slide often appears to indicate a change of shape which is not really existent. Special care is needed in basing conclusions upon the laterals in this and the allied groups (*Thais*, *Morula*, etc.).

The whole group will work out as follows:—

Subgenus Acanthina, G. Fischer, 1807, Mus. Demidoff, iii, p. 174 (= *Monoceros*, Lam. (pars), 1822, Anim. s. vert., vii, p. 250).

1. *Acanthina calcar* (Martyn).

1784. *Buccinum calcar*, Martyn, Universal Conchologist, i, f. 10.
1786. *B. monodon*, Solander, Portland Cat., p. 17, No. 372.
1788. *B. monodon*, Gmelin: Linné, Syst. Nat., 13th ed., p. 3483, No. 50.
1788 (?). *B. calcar-longum*, Martyn, Univ. Conch., ii, f. 50.
1822. *Monoceros imbricatum*, Lamarck, Anim. s. vert., vii, p. 251.
1822. *M. striatum*, Lamarck, Anim. s. vert., vii, p. 251.
1822. *M. breve*, Sowerby, Genera No. 5, pl. ccxxxix, f. 2.
1835. *M. acuminatum*, Sowerby, Proc. Zool. Soc. Lond., p. 50.
Var. *unicornis*, Brug.
1789. *Buccinum unicorne*, Bruguière, Encycl. Méth., Vers. i, p. 254.
1822. *Monoceros crassilabrum*, Lamarck, Anim. s. vert., vii, p. 252.
1822. *M. glabratum*, Lamarck, Anim. s. vert., vii, p. 251.
1835. *M. citrinum*, Sowerby, *costatum*, Sowb., *globulus*, Sowb., Proc. Zool. Soc. Lond., p. 50.

2. *Acanthina lugubris* (Sowerby).

1822. *Monoceros lugubre*, J. & G. B. Sowerby, Genera No. 5, pl. ccxxxix, f. 3.
1825. *M. cymatum*, Sowerby, Tankerv. Cat., No. 1888.
1828. *Buccinum armatum*, Wood, Suppl., p. 12, No. 12, pl. iv (Bucc.), f. 12.
1835. *Monoceros cymatum*, Sowerby, Conch. Illust., sp. 6, pl. lxxxii, f. 11.
1835. *M. cymatum*, Sowerby, Proc. Zool. Soc. Lond., p. 50.

Subgenus Acanthinucella, n.

1. *Acanthinucella punctulata* (Sowerby).

1835. *Monoceros punctulatum*, Sowerby, Proc. Zool. Soc. Lond., p. 50.
1835. *M. punctulatum*, Sowerby, Conch. Illust., sp. 13, pl. lxxix, f. 3.
1837. *Purpura* (*Monoceros*) *lapilloides*, Conrad, Journ. Acad. Nat. Sci. Philad., vii, p. 265, pl. xx, f. 18.

1839. *Monoceros punctatum*, Gray, Zoology Beechey's Voyage, p. 124.
1846. *M. punctatum*, Gray: Reeve,[1] Conch. Icon., *Monoceros*, sp. 2.

2. *Acanthinucella unicarinata*[2] (Sowerby).

1835. *Monoceros unicarinatum*, Sowerby, Proc. Zool. Soc. Lond., p. 50.
1835. *M. unicarinatum*, Sowerby, Conch. Illust., sp. 14, pl. lxxxi, f. 5.
1837. *Purpura* (*Monoceros*) *engonata*, Conrad, Journ. Acad. Nat. Sci. Philad., vii, p. 264, pl. xx, f. 17.
1837. *P.* (*Monoceros*) *brevidens*, Conrad, Journ. Acad. Nat. Sci. Philad., vii, pp. 264–5.
1846. *Monoceros unicarinatum*, Sowerby: Reeve,[1] Conch. Icon., *Monoceros*, sp. 1.

3. *Acanthinucella paucilirata* (Stearns).

1872. *Monoceros paucilirata*, Stearns, Amer. Journ. Conch., vii, p. 167, pl. xiv, f. 16.

At a distance from these, and close to *Rapana*, will come —

Subgenus NEORAPANA, n.

1. *Neorapana muricata* (Broderip).

1832. *Purpura muricata*, Broderip, Proc. Zool. Soc. Lond., p. 125.
1833. *P. truncata*, Duclos, Mag. Zool., pl. xxii, f. 2.
1835. *Monoceros*[3] *tuberculatum*, Sowb. (Gray MS.), Conch. Illust., sp. 15, pl. lxxxii, f. 9.

2. *Neorapana grandis* (Sowerby).

1835. *Monoceros grande*, Sowb. (Gray MS.), Conch. Illust., sp. 7, pl. lxxix, f. 1–1*a*.
1835. *Purpura grayi*, Kien., Iconographie, *Purpura*, p. 109, pl. xxviii, f. 74.
1839. *Monoceros grandis*, Gray, Zool. Beechey's Voyage, p. 124.

---

[1] Reeve unfortunately reverses, in error, the numbers denoting the figures of his species 1 and 2, *unicarinatum* and "*punctatum*".

[2] Blainville's *Purpura spirata* (Nouv. Annales Muséum Paris, i, 1832, p. 252, No. 105, pl. xii, fig. 8) has been generally accepted as a large variety of *engonata*, and would take precedence. Certainly the figure is remarkably like *engonata*. But the description makes one hesitate: "Les prémiers [tours] sont cordonnés par des séries décurrentes de squames, le dernier seulement strié; ouverture ovale, subcanaliculée . . . cinq denticules au bord droit; couleur brune en dehors, d'un blanc violet en dedans. Cette jolie espèce nous paroit parfaitement distincte de toutes celles qui composent aujourd'hui le genre Pourpre, principalement par la différence de travail que présentent les tours de la spire à la surface." He does not mention the spine, which certainly becomes obscure in some forms of the species, and his description of the surface markings does not accord with *engonata*. Nor do the five tubercles inside the outer lip. Nor the locality (Sandwich Is.).

[3] An examination of a fine series in the Natural History Museum from St. Elena, W. Colombia (M.C.), shows conclusively that the "species" is a variety of *muricata* in which the tubercles, instead of being scaled and running into one another, are long, separate, and considerably smoother than in the typical form.